

Three new species of *Tecticornia* (formerly *Halosarcia*) (Chenopodiaceae: Salicornioideae) from the Eremaean Botanical Province, Western Australia

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Abstract

Shepherd, K.A. Three new species of *Tecticornia* (formerly *Halosarcia*) (Chenopodiaceae: Salicornioideae) from the Eremaean Botanical Province, Western Australia. *Nuytsia* 17: 353–366 (2007). Three new samphires that occur on saline floodways and around salt lakes in the semi-arid and arid zones of the Eremaean Botanical Province are described. *Tecticornia cymbiformis* K.A.Sheph. & Paul G.Wilson, a conservation Priority listed species currently known from three disjunct populations, has been recognised as distinct for a number of years but has never been formally described. A second Priority species, *T. mellaria* K.A.Sheph., is only found on gypseous dunes in the vicinity of a large gold mine in the eastern Goldfields. *Tecticornia laevigata* K.A.Sheph., is closely allied to *T. mellaria* but has a widespread distribution and is not considered to be under threat. Images are included along with distribution maps and an amended “Flora of Australia” key to the former genus *Halosarcia* Paul G.Wilson.

Introduction

The recent inclusion of *Halosarcia* Paul G.Wilson and other allied Australian genera into *Tecticornia* Hook.f. (Shepherd and Wilson 2007), is the first major taxonomic work on the Australian samphires (subfamily Salicornioideae, Chenopodiaceae) since Wilson’s (1984) “Flora of Australia” treatment. In the 23 years following this revision, a number of potentially new samphires from the former genus *Halosarcia* have been discovered (Western Australian Herbarium 1998–) but until recently, none have been formally named.

Tecticornia cymbiformis K.A.Sheph. & Paul G.Wilson is one such species. First recognised by Wilson (*in sched.*) in 1991 as potentially new, this species is characterised by distinctive ‘boat shaped’ bracts and the name *Halosarcia cymbiformis* Paul G.Wilson ms was proposed. This was later changed to *H. sp.* Lake Anneen (A.L. Payne 320), to conform to the naming schema for undescribed taxa developed as part of the Australian Plant Census project (Barker 2005). Only three populations of *T. cymbiformis* are known and it has a Priority Three conservation listing under the Department of Environment (DEC) Conservation Codes for Western Australian Flora (Atkins 2006).

Another samphire of conservation concern was discovered in 1994 growing on the margin of a salt lake east of Leonora. *Tecticornia mellaria* K.A.Sheph., is readily distinguished by its large, glaucous,

bluish-green articles and distinctive ellipsoid inflorescences. Originally allocated the phrase name *Halosarcia* sp. Angel Fish Island (B. Davey 4), this species is only found on pastoral and mining leases over a range of c. 18 km. A subsequent population was reported from a nearby salt lake to the south but no other plants have been discovered during surveys in the vicinity. In 1995 a gold mine commenced operations on the eastern shore of the main salt lake on which this species grows. As this species is poorly known and occurs on unprotected land it has a Priority One conservation status (Atkins 2006).

Tecticornia laevigata K.A. Sheph. is a more widespread species allied to *T. mellaria* but distinguished from it in part by its smaller, dull, green articles and smaller seeds. This species was also supported as genetically distinct from *T. mellaria* in a molecular sequence study (as *Halosarcia* sp. Angel Fish Island (B. Davey 4) *aff.* KS 864) (Shepherd 2004; Shepherd *et al.* 2004). In May 2004 this species was given the phrase name *H.* sp. Lake Sunshine (S. van Leeuwen 4973).

Tecticornia mellaria and *T. laevigata* are part of a group of taxa allied to the morphologically variable *T. undulata* (Paul G. Wilson) K.A. Sheph. & Paul G. Wilson. In her field guide to Western Australian samphires Datson (2002) referred to *T. laevigata* as *Halosarcia aff. undulata* 'Mt Morgan' and noted two other potential informal taxa (*H. aff. undulata* 'Barlee' and *H. aff. undulata* 'Nigracauda'). Further field work is required to clarify the status of these taxa.

Although taxonomic revisions are on-going in *Tecticornia*, these three species are described here separately as they can be clearly circumscribed and because two of them have Priority conservation status and have been recognised as distinct for well over a decade

Methods

The general morphology for the subfamily Salicornioideae is outlined in detail elsewhere (Wilson 1980; Shepherd 2004; Shepherd *et al.* 2005b; Shepherd & Wilson 2007), however, terminology used to describe the bracts is clarified here. Each inflorescence is comprised of decussate pairs of succulent bracts which may be free or fused. The shape and curvature of each bract is described firstly from the face or front-on view, at the widest point. The side view is then described where the bract is at its narrowest and may be fused to the opposite bract. The bract outer face may be flat or strongly protruding in the front-on view. The apex of the bract can be truncate or acuminate and the margin may be entire or dissected. Each bract pair may be fully exposed or almost completely covered by the subtending bracts below.

This study is based on the examination of herbarium specimens lodged at PERTH, fresh material and 70% ethanol preserved material. *Tecticornia mellaria* grown from seed collected by J. English and maintained at the School of Plant Biology glasshouses at The University of Western Australia (UWA) for a PhD Research project (J. English 2004) were also examined. Images of seeds were produced using an Environmental Scanning Electron Microscope (Danilastos 1993). Species distributions are those employed on FloraBase, which are modified from the Interim Biogeographic Regionalisation for Australia (IBRA) Version 5.1 categories (Thackway & Cresswell 1995; Western Australian Herbarium 1998–; Environment Australia 2000). The distribution map was created using DIVA-GIS freeware Version 5.2.0.2 (<http://www.diva-gis.org/>) and is based on IBRA Version 6.1 (Department of the Environment and Water Resources 2007) with coordinates from collections lodged at PERTH. Due to conservation concerns the precise localities for Priority species are withheld.

Taxonomy

Tecticornia cymbiformis K.A. Sheph. & Paul G. Wilson, *sp. nov.*

Tecticorniae undulatae (Paul G. Wilson) K.A. Sheph. & Paul G. Wilson affinis sed bracteis cymbiformibus, marginibus fimbriatis, semine porphyreo, opaco et laevi, differt.

Typus: Lake Anneen, Western Australia [precise locality withheld for conservation purposes], 21 August 2001, K.A. Shepherd & J. Tucker KS 870 (*holo*: PERTH 07464622; *iso*: CANB).

Halosarcia cymbiformis Paul G. Wilson ms, G. Paczkowska & A.R. Chapman, West. Austral. Fl.: Descr. Cat. p. 204 (2000), *nom. inval.*

Halosarcia sp. Lake Anneen (A.L. Payne 320) Western Australian Herbarium, in FloraBase, <http://florabase.dec.wa.gov.au> [accessed June 2007].

Perennial erect shrub to 0.3–0.5 m high. *Vegetative articles* cylindrical to obovoid, oval or circular in cross section, dull green or deep red to burgundy, senescing to grey-brown, 3.5–7.2 mm long, 2–5 mm wide, apex truncate, margin fimbriate. *Inflorescence* 5–10 mm long, 3.2–6 mm wide, of 3-flowered cymes forming a spike of 3–7 nodes, with a very strongly undulating, ellipsoidal outline; terminal to main or lateral branches. *Bracts* fused, cymbiform, convex in face view with the upper edge strongly curved, concave in side view with the upper edge very strongly curved, outer face of bract strongly protruding, apex truncate, margin fimbriate; with overlapping subtending bracts. *Flowers* hermaphrodite and obscured by the subtending bract, fused to the bract above, contiguous or fused with adjacent florets and contiguous with opposite florets. *Perianth* fused and dorsiventrally compressed with both the adaxial and abaxial surfaces vertically orientated, apex acute, with the aperture at or just below the apex; lobes 2 with the abaxial lobe absent, medial walls thin and lateral walls thick, margins entire. *Stamen* 1, the anther elliptic, 1.2–1.4 mm long, abaxial to the ovary. *Ovary* free from the stem cortex; style bifid, membranous. *Fruiting spikes* scarcely expanded, pithy or crustaceous, with the adaxial surface of the bract brown or grey and dull; retained on branches for a year or more, sometimes with apical vegetative growth, seed released only after the eventual decay of the bracts and perianth. *Fruitlets* obscured by the subtending bract, sunken into the stem, free from bracts above, free from adjacent fruitlets and conjunct with opposite fruitlets; fruiting perianth chartaceous or crustaceous, enclosing the seed, dehiscent \pm in the medial plane; style at fruiting stage membranous or absent. *Pericarp* chartaceous, free from the perianth, sometimes enclosing and partially fused with the seed surface. *Seed* vertical relative to the stem axis, ovate with a beak, 0.7–0.8 mm long, opaque, red-brown without ornamentation. *Embryo* \pm straight, perisperm present. (Figures 1, 2)

Specimens examined. WESTERN AUSTRALIA: [localities withheld] 26 May 1996, C. Day ANL 91 (PERTH 04910605); 21 Feb. 1990, E.M. Goble-Garratt EGG 28 (PERTH 02483599), EGG 31 (PERTH 02483556); 28 Mar. 1976, R.J. Hnatiuk s.n. (PERTH 02483564); 11 Apr. 1987, A.L. Payne 320 (PERTH 02483572); 2 Nov. 1987, A.L. Payne 437 (PERTH 02483580); 21 Aug. 2001, K.A. Shepherd & J. Tucker KS 869 (PERTH 07464630); 21 Aug. 2001, K.A. Shepherd & J. Tucker KS 871 (PERTH 07464649).

Distribution and habitat. Occurs in the Murchison and Yalgoo IBRA regions of the Eremaean Botanical Province (Figure 3). This species grows on saline floodways and along the edge of creeklines between stands of spinifex and mulga or with *Eragrostis falcata*, *Frankenia laxiflora* and *Muellerolimon salicorniaceum*.



Figure 1. Holotype of *Tecticornia cymbiformis* (K.A. Shepherd & J. Tucker KS 870). Scale = 3cm.



Figure 2. *Tecticornia cymbiformis*. A – fruiting spike showing the distinctive ‘boat-like’ cymbiform bracts with the strongly protruding outer face (arrow) (K.A. Shepherd & J. Tucker KS 870); B – seed (K.A. Shepherd & J. Tucker KS 869). Scale bars = 0.5 cm (A) and 100 μ m (B).

Phenology. This species flowers from March to May. Fruits are retained on the plant for a year or more.

Conservation status. Department of Environment and Conservation (DEC) Conservation Codes for Western Australian Flora: Priority Three (Atkins 2006). This species is currently known from only three isolated populations.

Etymology. From the Latin *cymbiformis* (boat-shaped), referring to the distinct shape of the fertile bracts of the inflorescence.

Affinity. In a combined nuclear and chloroplast molecular phylogeny of 43 taxa from the subfamily Salicornioideae (Chenopodiaceae), *Tecticornia cymbiformis* (as *Halosarcia cymbiformis* ms) placed as sister to *T. laevigata* (as *H. sp.* Angel Fish Island (B. Davey 4) *aff.* KS 864) (Shepherd 2004). In a subsequent morphological phylogenetic analysis which included 64 binary and multistate characters scored from 62 taxa, *T. cymbiformis* placed as sister to *T. undulata* (as *H. undulata*) (Shepherd *et al.* 2005b). *Tecticornia cymbiformis* is readily distinguished from these species by its unique cymbiform bracts, where the outer face of each bract is so strongly protruding they appear ‘boat-like’. The bracts of *T. cymbiformis* have fimbriate margins and become pithy or chartaceous and dull when in the fruit. Further, the pericarp in *T. cymbiformis* is partially fused to the seed, which is opaque, red-brown and smooth (Figure 2; Shepherd *et al.* 2005a). In contrast, the outer face of each bract in *T. laevigata* is not protruding and hence the inflorescence has a relatively smooth ovoid or ellipsoidal outline. The margins of the bracts of *T. laevigata* are entire and in the fruiting spikes the bracts are pithy or crustaceous, black and shiny. Further, the seed is opaque and brown, with ornamentation on the outer margin. While the outer face of the bracts in *T. undulata* does protrude, giving the inflorescence an undulating outline, this protuberance is not as extreme as in *T. cymbiformis*. The bracts of *T. undulata* are also entire or slightly dentate and in fruit the bracts are spongy to crustaceous and dull. In *T. undulata* the pericarp is free from the seed, which is light gold-brown and somewhat translucent, so the outline of the perisperm is evident. The outermost margin of the seed is also sometimes faintly ornamented.

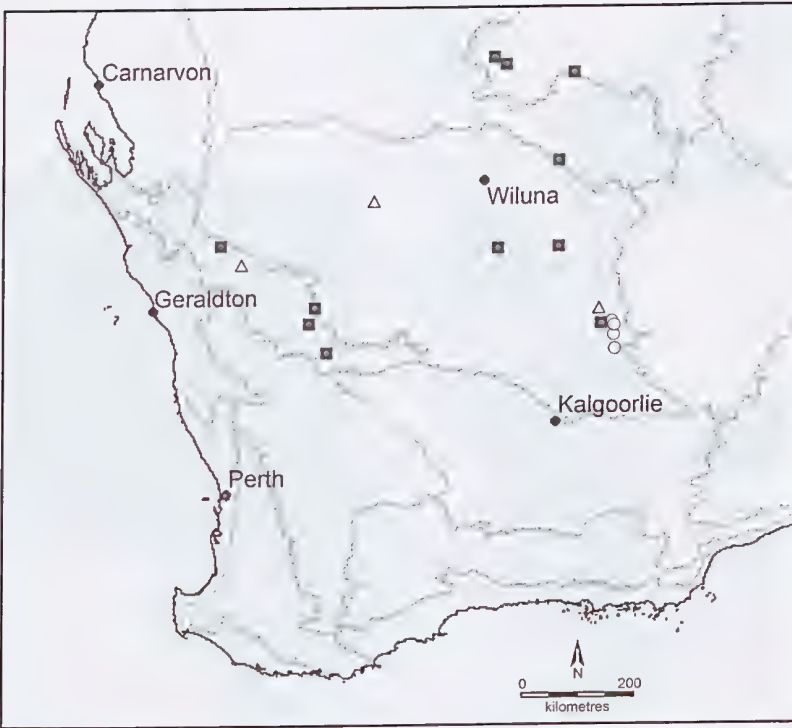


Figure 3. Distribution of *Tecticornia cymbiformis* (Δ), *T. mellaria* (\circ) and *T. laevigata* (\blacksquare) in the Eremaean Botanical Province, Western Australia.

***Tecticornia mellaria* K.A.Sheph., sp. nov.**

Tecticorniae chartaceae (Paul G. Wilson) K.A. Sheph. & Paul G. Wilson affinis sed articulis vegetativis amplis, cupiformibus, caesioviridibus, glaucis; semine brunneo opaco et papilloso differt.

Typus: Lake Carey, Western Australia [precise locality withheld for conservation purposes], 23 January 1996, C. Beavis 4 (*holo*: PERTH 05588022; *iso*: CANB).

Halosarcia sp. Angel Fish Island (B. Davey 4), in G. Paczkowska & A.R. Chapman, West. Austral. Fl.: Descr. Cat. p. 205 (2000).

Perennial erect shrub to 0.2–0.4 m high. *Vegetative articles* moniliform, barrel-shaped to spherical, circular in cross section, glaucous bluish-green, senescing to pale brown, 5.5–20 mm long, 3.5–10.5 mm wide, apex truncate or acute, margin entire. *Inflorescence* 8–26 mm long, 6–11 mm wide, of 3-flowered cymes forming a spike of 5–17 nodes, with a sinuate or almost smooth, ovoid or ellipsoidal outline; terminal to main or lateral branches. *Bracts* fused, shallowly convex in face view with the upper edge gently curved, very shallowly concave in side view with the upper edge shallowly curved to straight, outer face of bract flat, apex truncate, margin entire; with slightly overlapping subtending bracts. *Flowers* hermaphrodite and fully covered or partially exposed by subtending bracts, free from bracts above, fused with adjacent florets and free from opposite florets. *Perianth* fused and dorsiventrally compressed with both the adaxial and abaxial surfaces horizontally orientated, apex acute, with the aperture at or just below the apex; lobes 2 with the abaxial lobe absent, medial walls thin and lateral walls thick, margins

entire. *Stamen* 1, the anther elliptic, 1.4–1.6 mm long, abaxial to the ovary. *Ovary* free from the stem cortex; style bifid, membranous. *Fruiting spikes* scarcely expanded, pithy or crustaceous with the adaxial surface of the bract grey or black, dull or rarely shiny; retained on branches for a year or more, without apical vegetative growth, seed generally released as the bracts separate with age and after the eventual decay of the perianth. *Fruitlets* obscured by the subtending bract or partially exposed, sunken in the stem, free from bracts above, free from adjacent fruitlets and opposite fruitlets; fruiting perianth membranous-papery, enclosing the seed, dehiscent in the medial plane; style at fruiting stage membranous. *Pericarp* membranous-papery, free from the perianth, enclosing and sometimes partially fused with the seed surface. *Seed* horizontal relative to the stem axis in the central fruitlet and horizontal and rotated flat to one side in the lateral fruitlets within each 3-flowered cyme, ovate with a slight beak, 1.1–1.5 mm long, opaque, brown with ornamentation of small spaced bumps in rows on the extreme outer margin. *Embryo* ± straight, perisperm present. (Figure 4, 5)

Specimens examined. WESTERN AUSTRALIA: [localities withheld] July 1998, *B. Davey* 4 (PERTH 05100348); 9 July 1998, *J. English s.n.* (PERTH 05089220); 1994, *Mattiske Consulting Pty Ltd* 72-94 (PERTH 05117763); 20 Oct. 1994, *D. True* DET 11022 (PERTH 04316797).

Distribution and habitat. Currently known from two populations in the Murchison IBRA region of the Eremaean Botanical Province (Figure 3). This species grows on well drained red gypseous dunes down to the edge of the lake playa or on gypseous clay pans in association with other samphire species such as *Tecticornia undulata*, *T. pergranulata* and *Frankenia* species.

Phenology. Flowers from September to October. Fruits are retained on the plant for a year or more.

Conservation status. DEC Conservation Codes for Western Australian Flora: Priority One (Atkins 2006). This species is currently known from one salt lake over a range of *c.* 18 km and occurs on pastoral and mining leases. It has also been reported from a second lake nearby (Datson 2002) but no other plants have been discovered during surveys in the vicinity. While it has been reported that this species colonised areas disturbed by mining activity (Datson 2002), little is known of the overall impact of the surrounding land use on these populations in the long term.

Etymology. From the Latin *mellarium* (beehive), in reference to the mature inflorescence which is shaped like a stylised beehive.

Affinity. Based on a morphological phylogenetic analysis, *T. mellaria* is closely allied to *T. laevigata* and *T. chartacea* (Paul G. Wilson) K.A. Sheph. & Paul G. Wilson (Shepherd 2004; Shepherd *et al.* 2004; Shepherd *et al.* 2005b). It is distinguished from both species by its large, barrel-shaped to spherical articles that are glaucous and bluish-green, and distinctive ellipsoid inflorescences. The fruitlets of *T. mellaria* remain covered or are only partially exposed by the overlapping subtending bracts (Figure 5B) and the seeds are generally retained on the plant. In contrast, the papery bracts of *T. chartacea* separate completely into plate-like rings, as the fruitlets containing the seeds fall free. The fruitlets of *T. mellaria* and *T. laevigata* split down the medial plane to eventually release a brown and opaque seed with faint ornamentation on the outer margin and apex (Type 1 in Shepherd *et al.* 2005a). In *T. chartacea* the perianth does not split down the medial plane and continues to enclose the smooth and somewhat translucent gold-brown seed. *Tecticornia chartacea* also grows on clay pans, often forming dense, pure stands in areas that may become waterlogged after winter rains, while *T. mellaria* grows away from the salt pan on well drained dunes.

Western Australian Herbarium
PERTH 05588022



HOLOTYPE

Tecticornia mellaria C.A. Sheph.

DETERMINAVIT Kelly S. Shephard 7/4/07
Western Australian Herbarium (PERTH)

WESTERN AUSTRALIAN HERBARIUM, PERTH
Flora of Western Australia

Halimaria sp. Angel Fish Island (B. Davey 4)

Cyrtopodiaceae

Rounded 30 cm high shrub. Fleshy, pea-shaped segments.
Cis-pitlerous dunes. Growing close to salt lake.

Coll. C. Beavis 4 Date: 23.01.1996

Dups. to
PERTH 05588022



Department of Environment and Conservation
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Figure 4. Holotype of *Tecticornia mellaria* (C. Beavis 4). Scale = 3cm.

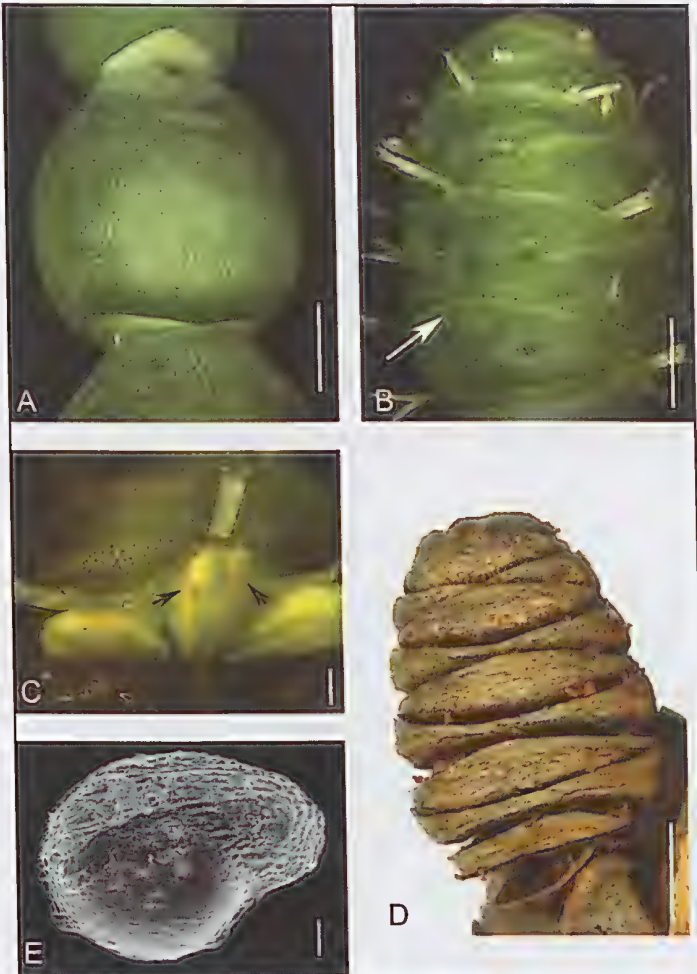


Figure 5. *Tecticornia mellaria*. A – vegetative article; B – ellipsoidal inflorescence with exserted styles. Shallowly convex outer face of the bract (arrow) with a gently curved upper edge, overlapping the bract above; C – 3-flowered cyme, showing each dorsiventrally compressed flower, each fused perianth has 2 lobes (arrows); D – fruiting spike showing the pithy to crustaceous bracts beginning to separate from the bract pair above (C. Beavis 4); E – a seed with small bumps on the outer margin. Scale bars = 0.5 cm (A – B, D); 0.5 mm (C); 100 μ m (E).

Tecticornia laevigata is readily distinguished from *T. mellaria* by its smaller articles with smaller, dull green inflorescences, shining black abaxial and adaxial surfaces of the bracts in fruit and the pericarp which is free from the small, orbicular seed.

Notes. The orientation of the seeds in *T. mellaria* and *T. laevigata* are unusual. Within each 3-flowered cyme the central seed is horizontal but the lateral seeds are described as ‘Type 2’ (Shepherd *et al.* 2005a), where they are orientated horizontally but are rotated 90 degrees to the left or right. The only other Australian samphire species with this type of seed orientation are *T. chartacea* and *T. flabelliformis* (Paul G. Wilson) K.A. Sheph. & Paul G. Wilson (Shepherd *et al.* 2005a).

Tecticornia laevigata K.A.Sheph., *sp. nov.*

Tecticorniae mellariae K.A.Sheph. affinis sed articulis vegetativis minoribus, viridibus hebitebus; inflorescentia parva; bracteis atris laevigatis; semine minus quam Imm longo, differt.

Typus: north end of Mongers Lake, Western Australia, 6 August 1969, *Paul G. Wilson* 8602 (*holo*: PERTH 05932726; *iso*: CANB, MEL, NSW).

Halosarcia sp. Lake Sunshine (S. van Leeuwen 4973), Western Australian Herbarium, in FloraBase, <http://florabase.dec.wa.gov.au> [accessed June 2007].

Illustration. Nikulinsky P. (1983), Plate 6 (as *Halosarcia undulata*).

Perennial erect subshrub to 0.15–0.5 m high. *Vegetative articles* barrel-shaped to spherical, circular in cross section, dull green, senescing to grey or dark brown, 1.5–6 mm long, 2.5–4 mm wide, apex rounded or truncate, margin entire. *Inflorescence* 7–14 mm long, 4.5–6.5 mm wide, of 3-flowered cymes forming a spike of 9–18 nodes, with a sinuate to almost smooth, ovoid or ellipsoidal outline; terminal to main or lateral branches. *Bracts* fused, shallowly convex in face view with the upper edge gently curved to straight, very shallowly concave in side view with the upper edge shallowly curved to straight, outer face of bract flat, apex truncate, margin entire; with slightly overlapping subtending bracts. *Flowers* hermaphrodite and fully covered or partially exposed by the subtending bract, free from bract above, fused with adjacent florets and free from opposite florets. *Perianth* fused and dorsiventrally compressed with both the adaxial and abaxial surfaces horizontally orientated, apex truncate or acute, with the aperture at or just below the apex; lobes 2 with the abaxial lobe absent, medial walls thin and lateral walls thick, margins entire. *Stamen* 1, the anther elliptic, 1.1–1.4 mm long, abaxial to the ovary. *Ovary* free from the stem cortex; style bifid, membranous. *Fruiting spikes* scarcely expanded, chartaceous or crustaceous with the adaxial surface of the bract black and shiny; retained on branches for a year or more, without apical vegetative growth, seed generally released as the bracts separate with age and after the eventual decay of the perianth. *Fruitlets* obscured by the subtending bract, sunken in the stem, free from bracts above, free from adjacent fruitlets and separated or conjunct with opposite fruitlets; fruiting perianth membranous-papery or chartaceous, enclosing the seed, dehiscing in the medial plane; style at fruiting stage membranous or absent. *Pericarp* membranous-papery or chartaceous, free from the perianth, enclosing the seed and free from the seed surface. *Seed* horizontal relative to the stem axis in the central fruitlet and horizontal and rotated flat to one side in the lateral fruitlets within each 3-flowered cyme, orbicular with a beak, 0.7–0.8 mm long, opaque, light gold-brown to brown with ornamentation of small bumps scattered randomly on the extreme outer margin or on the outer edge and part of central area. *Embryo* ± straight, perisperm present. (Figure 6, 7)

Specimens examined. WESTERN AUSTRALIA: Lake Carey, 23 Jan. 1996, *C. Beavis* 2 (PERTH); Lake Deborah West, reserve No 13730, 11 Dec. 1994, *N. Casson & A. Harris* G 20.2 (PERTH); White Lake, Canning Stock Route, 3 Apr. 1971, *S.J.J. Davies s.n.* (PERTH); LGS 11, Lorna Glen Station, 150 km ENE of Wiluna, 13 Mar. 2003, *D.J. Edinger & G. Marsh* DJE 3273 (PERTH); 110 km SE of Yalgoo on Yalgoo – Paynes Find road, 5 km SE of Fields Find, 22 Oct. 1983, *S.J. Forbes* 1743 (PERTH); Little Sandy Desert, 7.9 km WSW of Yanneri Lake, 29.2 km NE of Kulonoski East Well, 26.8 km NW of Lake Sunshine, 31 km SE of Moffetah Well, 24 Oct. 1996, *S. van Leeuwen* 3022 (PERTH); Little Sandy Desert, north-western end of northern arm of Lake Sunshine, 22.5 km SE of Yanneri Lake, 16 km S of Terminal Lake, 41.5 km ENE of Kulonoski East Well on Beyondie Station, 30.9 km N of Bullen Hill, 18 Aug. 2001, *S. van Leeuwen* 4973 (PERTH); Lake Darlot, Nov. 1982, *P. Nikulinsky s.n.* (PERTH);

Woolgorong Station, No 7 Creek, 10 km NW of homestead, 27 July 1995, *M. Officer* 71 (PERTH); N end of Lake Moore, 7 Aug. 1969, *Paul G. Wilson* 8637 (PERTH); Lake Miranda, c. 140 km S of Wiluna, 27 Aug. 1970, *P.G. Wilson* 8924a (PERTH).

Distribution and habitat. Grows throughout the Little Sandy Desert, Gascoyne, Murchison and Yalgoo IBRA regions of the Eremaean Botanical Province (Figure 3), near the edge of salt lakes and on saline flats in light brown sandy clay. Sometimes associated with open *Melaleuca* shrublands on nearby sandy rises and *Frankenia* spp. and *Tecticornia* spp. on the saline flats.

Phenology. Flowering from July to September. Fruits retained for a year or more.

Conservation status. This species is widespread and is not considered threatened.

Etymology. From the Latin *laevigatum* (smooth, polished), in reference to the smooth, shiny, adaxial surface of the bract when in fruit.

Affinity. See notes under *T. cymbiformis* and *T. mellaria*.

Notes. When describing *Halosarcia undulata* (now *T. undulata*), Wilson (1980) noted a number of collections that may represent either a new, closely allied species or a hybrid between an unknown species and *H. undulata*. Wilson indicated that these specimens had "ovoid to ellipsoid pedunculate spikes, pithy perianths, and black carbonaceous pericarps" and few produced seed. In specimens that did have seed, it was noted that the seed coat was papillose on the outer margin rather than smooth.



Figure 6. Fruits of *Tecticornia laevigata* (*P.G. Wilson* 8602), scale = 0.5 cm.



Figure 7. Holotype of *Tecticornia laevigata* (P.G. Wilson 8602). Scale = 3cm.

In general, this description matches that of *T. laevigata*. Three specimens listed in Wilson (1980) as putative hybrids (*P.G. Wilson* 8602, *P.G. Wilson* 8637 and *P.G. Wilson* 8924a) can be referred to this species. Two further specimens (*P.G. Wilson* 8569 and *P.G. Wilson* 8856) from Lake Austin and Lake Barlee, respectively, are not *T. laevigata*. These specimens, along with another collection (*R.J. Cranfield* 7335), may represent the taxon referred to by Datson (2002: 94–95) as *H. aff. undulata* 'Barlee.' Further field work is required however, to ascertain the exact status of this taxon with respect to *T. mellaria*, *T. laevigata* and the morphologically variable *T. undulata*. A further putative hybrid specimen listed by Wilson (*J.H. Maiden* NSW 136567) has not been examined. As the location is given as Cue, this specimen may well be *T. laevigata*.

See comments under *T. mellaria* about seed orientation in *T. laevigata*.

Amended 'Flora of Australia Key' to the species of *Tecticornia* (formally *Halosarcia*) (Wilson 1984: 282) from couplet 14

14. Margins of articles and of bracts denticulate or ciliate
15. Perianth pithy in fruit; pericarp horny all over (not torn at base) 23. *T. indica*
- 15: Perianth membranous, cartilaginous or crustaceous in fruit; pericarp membranous at least towards the base
16. Articles with truncate lobes; fruitlets falling entire
- 16a. Bracts obovoid to barrel-shaped; pericarp free from the seed; seed gold-brown, translucent 19. *T. entrichoma*
- 16a: Bracts cymbiform; pericarp partially fused to the seed; seed red-brown, opaque *T. cymbiformis*
- 16: Articles with acuminate to caudate lobes; fruitlets tearing at base to expose seed
17. Articles glossy, entire to crenulate on margin; perianth entire on margin 3. *T. nitida*
- 17: Articles dull or glossy, fimbriate on margin; perianth fimbriate on margin 2. *T. fimbriata*
- 14: Margins of articles and of bracts entire
18. Perianth pithy in fruit; pericarp horny at least towards apex 23. *T. indica*
- 18: Perianth various in fruit but not pithy; pericarp membranous or chartaceous
19. Perianth membranous or chartaceous; fruitlets free from each other
20. Articles shortly acuminate; inflorescence 80 mm long 21. *T. cupuliformis*
- 20: Articles truncate; inflorescence 7–40 mm long
- 20a. Mature inflorescence separates into plate-like rings to release fruitlets; seed gold-brown, translucent, smooth 20. *T. chartacea*
- 20a: Mature inflorescence ellipsoid and generally retains fruitlets; seed brown, opaque, ornamented on the outer margin
- 20b. Articles glaucous, bluish-green 5.5–20 mm long, 3.5–10.5 mm wide; inflorescence 8–26 mm long; pericarp partially fused to the seed; seed 1.1–1.5 mm long *T. mellaria*
- 20b: Articles not glaucous, dull green 1.5–6 mm long, 2.5–4 mm wide; inflorescence 7–14 mm long; pericarp free from the seed; seed less than 1 mm long *T. laevigata*
- 19: Perianth crustaceous; fruitlets free or united

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